THE CLAIMS

What is claimed is:

1. An elongated gas sensor element formed by one or more gas-sensing filaments, said elongated gas sensor element comprising two electrical connection terminals and having a longitudinal axis, wherein the longitudinal axis of the sensor element is substantially perpendicular to a line defined by the two electrical connection terminals thereof.

2. The elongated gas sensor element of claim 1, wherein said one or more gas-sensing filaments are characterized by an average diameter of less than about 500 microns.

3. The elongated gas sensor element of claim 1, wherein said one or more gas-sensing filaments are characterized by an average diameter of less than about 150 microns.

4. The elongated gas sensor element of claim 1, wherein said one or more gas-sensing filaments are characterized by an average diameter of less than about 50 microns.

5. The elongated gas sensor element of claim 1, wherein said one or more gas-sensing filaments are characterized by an average diameter in a range of from about 0.1 micron to about 30 microns.

6. The elongated gas sensor element of claim 1, characterized by a length of more than about 1 cm along its longitudinal axis.

7. The elongated gas sensor element of claim 1, characterized by a length of more than about 10 cm along its longitudinal axis.

8. The elongated gas sensor element of claim 1, characterized by a length of more than 20 cm along its longitudinal axis.

9. The elongated gas sensor element of claim 1, characterized by a wishbone shape.

10. The elongated gas sensor element of claim 1, comprising a nickel-containing coating that encapsulates a core structure, wherein said core structure has an electrical resistivity that is higher than that of the nickel-containing coating and a heat capacity that is lower than that of the nickel-containing coating.

11. The elongated gas sensor element of claim 10, wherein the electrical resistivity of the core structure is at least about fifty times higher than that of the nickel-containing coating, and wherein the heat capacity of said core structure is less than three-fourths of that of the nickel-containing coating.

12. The elongated gas sensor element of claim 10, wherein the electrical resistivity of the core structure is at least about a thousand times higher than that of the nickel-containing coating, and wherein the heat capacity of said core structure is less than one-half of that of the nickel-containing coating.

13. The elongated gas sensor element of claim 10, wherein the electrical resistivity of the core structure is at least about 10 $m\Omega \cdot cm$, and wherein the heat capacity of said core structure is less than 2.5 $J/K \cdot cm^3$.

14. The elongated gas sensor element of claim 10, wherein said core structure comprises a nickel-copper alloy, and wherein said nickel-containing coating consists essentially of nickel.

15. The elongated gas sensor element of claim 10, wherein said core structure comprises silicon carbide.

16. The elongated gas sensor element of claim 10, wherein said core structure comprises a composite fiber having multiple layers of different materials.

17. The elongated gas sensor element of claim 10, wherein said core structure comprises a composite fiber having a carbon core fiber coated with a silicon carbide layer.

18. The elongated gas sensor element of claim 1, comprising a nickel-copper alloy.

19. The elongated gas sensor element of claim 1, comprising a nickel-copper-aluminum alloy.

20. The elongated gas sensor element of claim 19, further comprising one or more metals selected from the group consisting of Ti, V, Cr, Mn, Nb, Mo, Ru, Pd, Ag, Ir, and Pt.

21. The elongated gas sensor element of claim 1, comprising a porous coating of nickel or nickel alloy.

22. The elongated gas sensor element of claim 21, wherein said porous coating is characterized by open pore structures.

23. A gas-sensing assembly comprising the elongated gas sensor element of claim 1 mounted on a support structure, wherein said support structure comprises a surface for mounting the two electrical connection terminals of the elongated gas sensor element.

24. The gas-sensing assembly of claim 23, further comprising means for detecting a change in at least one property of said elongated gas sensor element upon contact with a target gas species and responsively generating an output signal indicative of presence of said target gas species.

25. The gas-sensing assembly of claim 24, wherein the target gas species comprises a fluoro species selected from the group consisting of NF_3, SiF_4, C_2F_6, HF, F_2, COF_2, ClF_3, IF_3, and activated species thereof.

26. The gas-sensing assembly of claim 25, wherein the support structure comprises a material that is resistant to said target gas species.

27. The gas-sensing assembly of claim 25, wherein the support structure comprises polyimide or aluminum.

28. The gas-sensing assembly of claim 25, wherein said one or more gas-sensing filaments of the elongated gas sensor element contain nickel or nickel alloy.

29. The gas-sensing assembly of claim 28, wherein said one or more gas-sensing filaments of the elongated gas sensor element are electrochemically thinned after fabrication of said assembly to achieve an average diameter of not more than 50 microns.

30. The gas-sensing assembly of claim 28, wherein said one or more gas-sensing filaments of the elongated gas sensor element are characterized by an average diameter of not more than 25 microns.

31. The gas-sensing assembly of claim 28, wherein said one or more gas-sensing filaments of the elongated gas sensor element are characterized by an average diameter of not more than 10 microns.

32. The gas-sensing assembly of claim 28, wherein said one or more gas-sensing filaments of the elongated gas sensor element are characterized by an average diameter in a range of from about 0.1 micron to about 5 microns.

33. A method for monitoring a fluid locus for the presence of a target gas species therein, said method comprising:

exposing fluid at said fluid locus to a gas-sensing assembly as in claim 23;

monitoring at least one property of the elongated gas sensor element of such gas-sensing assembly; and

responsively generating an output signal when the elongated gas sensor element exhibits a change in the at least one property thereof, indicating the presence of the target gas species in the fluid locus, or a change in concentration of the target gas species in the fluid locus.

34. The method of claim 33, wherein said at least one property of the elongated gas sensor element being monitored is the electrical resistance thereof.

35. A method for fabricating the elongated gas sensor element of claim 9, comprising the steps of:

(a) aligning a pair of gas-sensing filaments side by side; and

(b) connecting said pair of gas-sensing filaments at first ends thereof, while leaving the opposite, second ends of said pair of gas-sensing filaments separated from each other, wherein the separated opposite, second ends of said pair of gas-sensing filaments form the two electrical connection terminals of the elongated gas sensor element.

36. The method of claim 35, wherein each of said gas-sensing filaments is formed by coating a filament with a gas-sensitive material.

37. A method for fabricating the elongated gas sensor element of claim 9, comprising the steps of:

(a) aligning a pair of filaments side by side;

(b) connecting said pair of filaments at first ends thereof, while leaving the opposite, second end of said pair of filaments separated from each other, so as to form a wishbone-shaped precursor structure; and

(c) forming a gas-sensitive coating over said wishbone-shaped precursor structure.

38. A gas-sensing assembly arranged in sensing relationship to a process chamber that is susceptible to presence of one or more target fluoro gas species, wherein said gas-sensing assembly comprises a nickel-containing gas sensor element mounted on a surface of a support structure and coupled to means for detecting a change in at least one property of said gas sensor element upon contact with the target fluoro gas species and responsively generating an output signal indicative of the presence of said target fluoro gas species, wherein said nickel-containing gas sensor element has a longitudinal axis that is oriented perpendicular to or substantially perpendicular to the mounting surface of the support structure.